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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Richard HULL, et al.) Group: 2681
Serial No.: 10/635,941) Examiner: Not yet assigned
Filed: August 5, 2003) Our Ref: B-5194 621143-9
For: "METHOD AND SERVER FOR)
ESTABLISHING COORDINATED CONSUMPTION)
OF A STREAMED MEDIA OBJECT BY)
MULTIPLE DEVICES") Date: January 5, 2004

CLAIM TO PRIORITY UNDER 35 U.S.C. 119

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Sir:

[X] Applicants hereby make a right of priority claim under 35
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<u>COUNTRY</u>	<u>FILING DATE</u>	<u>SERIAL NUMBER</u>
GREAT BRITAIN	6 August 2002	0218188.1
GREAT BRITAIN	18 October 2002	0223135.5

[] A certified copy of each of the above-noted patent
applications was filed with the Parent Application
No. _____.

[X] To support applicant's claim, a certified copy of each of the
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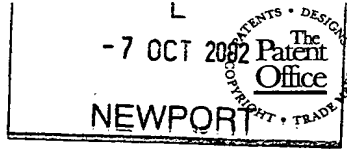
[] The priority document will be forwarded to the Patent Office
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by Suzanne Johnson

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P01/7700 0.0040223135.5

1/77

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NP10 8QQ

1. Your reference	300204856-01 GB		
2. Patent application number (The Patent Office will fill in this part)	0223135.5		
3. Full name, address and postcode of the or of each applicant (underline all surnames)	Hewlett-Packard Company 3000 Hanover Street Palo Alto CA 94304, USA Patents ADP number (if you know it) <u>496588004</u> If the applicant is a corporate body, give the country/state of its incorporation <u>Delaware, USA</u>		
4. Title of the invention	Method and Arrangement for Consumption of a Streamed Media Object by Multiple Devices		
5. Name of your agent (if you have one)	Robert F. Squibbs Hewlett-Packard Ltd, IP Section Filton Road, Stoke Gifford Bristol BS34 8QZ "Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)		
Patents ADP number (if you know it)	<u>79128187001</u>		
6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number	Country	Priority application number (if you know it)	Date of filing (day / month / year)
	GB	0218188.1	6/8/2002
7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application	Date of filing (day / month / year)	
8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if: a) any applicant named in part 3 is not an inventor, or b) there is an inventor who is not named as an applicant, or c) any named applicant is a corporate body. See note (d))	Yes		

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Description 19

Claim(s) 5

Abstract 1 *DM*

Drawing(s) 4 *+ 4*

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Statement of inventorship and right to grant of a patent (*Patents Form 7/77*) 1

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Signature

Robert Francis Squibbs

Date

3 / 10 / 2002

12. Name and daytime telephone number of person to contact in the United Kingdom

Tony Judd

Tel: 0117-312-8026

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Signed *Andrew Gorse*
Dated 29 July 2003

Method and Arrangement for Consumption of a Streamed Media Object by Multiple Devices

5 Field of the Invention

The present invention relates to methods and arrangements for consumption of a streamed media object by multiple devices.

Background of the Invention

- 10 For members of a party visiting a space with which media objects are associated, the shared experience can be enhanced by the sharing of such objects by the group members for presentation on mobile devices carried by the group members. Conventionally, media objects are shared by reference, for example by passing an appropriate URI. Where the media object is a streamed object, a recipient using a shared reference to the media object
- 15 will typically experience the streamed media object from its beginning, whilst the person who passed on the reference will already be some way through the streamed object. However, the person who passed on the reference may wish the recipient of the reference to experience the media object in a synchronized manner, i.e. to ensure that they both experience the same parts of the media stream in the same order and at the same time.
- 20 Colloquially, one person wishes to invite the second person to "listen to this" (or "look at this" etc). Multicast streaming protocols are known which enable a single media stream to be sent to multiple devices over the Internet with synchronization of multiple media channels within a composite, structured media stream (e.g. SMIL). However such protocols are not widely deployed in the internet.
- 25
- It is an object of the present invention to provide a way of coordinated presentation of a streamed media object on multiple devices without the use of multicasting protocols.

Summary of the Invention

According to one aspect of the present invention, there is provided a method of coordinated consumption of a streamed media object by first and second devices, the media object being accessible for streaming from a server, the method comprising the steps of:

- 5 (a) streaming the media object from the server to the first device and presenting it to a user of this device;
- (b) sending from the first device to the second device, during the course of step (a), data identifying the media object and a current position reached in presenting the object to the user of the first device;
- 10 (c) in response to a request from the second device, streaming the media object from the server to the second device in a separate stream to that involving the first device, and presenting the media object to the user of the second device such that normal presentation commences at a position at or with an advance relative to the said current position indicated in step (b).

15

According to another aspect of the present invention, there is provided an arrangement for coordinated consumption of a streamed media object by first and second devices, the arrangement comprising:

- a server for storing the media object and for streaming it to requesting devices;
- 20 - a first device comprising:
 - first means for requesting and receiving said media object in a stream from the server and for presenting it to a user of the device, and
 - second means for sending to the second device data identifying the media object and a current position reached in presenting the object to the user of the first
 - 25 device; and
- a second device comprising
 - first means for receiving said data from the first device and for using it to request the server to stream said media object to the second device, the server being arranged to respond to this request by streaming the media object to the second
 - 30 device in a separate stream to that involving the first device, and

- second means for presenting the media object to the user of the second device such that normal presentation commences at a position at, or with an advance relative to, the said current position indicated in said data.

5 **Brief Description of the Drawings**

Embodiments of the invention will now be described, by way of non-limiting example, with reference to the accompanying diagrammatic drawings, in which:

- Figure 1 is a diagram of an exhibition hall having an arrangement for delivering relevant media objects to visitors in a timely manner as the visitors encounter items of interest in the hall;
- Figure 2 is a diagram of a mobile device and service system used in the Figure 1 arrangement;
- Figure 3 is a diagram of a location report sent from the mobile device to the service system of Figure 2;
- Figure 4 is a diagram of a response message sent by the service system to the mobile device of Figure 2; and
- Figure 5 is a diagram illustrating coordinated consumption of a streaming media by two devices.

20 **Best Mode of Carrying Out the Invention**

- Figure 1 depicts a real-world environment for which a number of zones have been defined in a virtual world that maps onto the environment. When a person moving in the environment (called a “user” below) is detected as moving into one of these zones, one or more media objects are delivered to the user via a communications infrastructure and a mobile device carried by the user. A zone may correspond to an area around a real-world object of interest with the media object(s) delivered to a user in this area relating to that real-world object. Alternatively, a zone may not correspond to any real-world object.
- In considering such an arrangement, it is convenient, though not essential, to introduce the abstraction of a virtual feature which is the subject of each zone. Each such virtual feature is given a number of properties such as a unique identifier, a location in the real-world environment, the real-world extent of the zone associated with the feature, a subject description indicating what the feature concerns, and a set of one or more media-object

identifiers identifying the media objects (or “feature items”) associated with the feature. The zone associated with a virtual feature is referred to hereinafter as the ‘active zone’ of the feature.

- 5 For a feature that is intended to correspond to a particular real-world item (and typically having an active zone that maps to an area about a real-world object), this can be indicated in the subject description of the feature. Using the feature abstraction makes it easier to associate feature items that all relate to the same zone and also facilitates adding / removing these features items since data about the real-world extent of the related zone is
- 10 kept with the feature and not each feature item.

Each feature is represented by a feature record held in a data-handling system, the feature records together defining the aforesaid virtual world that maps to the real-world environment. Each feature can be thought of as existing in this virtual world with some of

15 these virtual features mapping to real-world objects.

- As already noted, when a user is detected as within an active zone of a feature, one or more feature items are delivered to the mobile device of the user for presentation to the user. A feature item can be presented automatically to the user upon delivery or the item can be
- 20 cached and only presented upon the user having expressed an interest in the feature in some way such as by dwelling in the active zone of the feature more than a minimum time or by explicitly requesting presentation of the feature item. Indeed, the delivery of the feature item to the mobile device can also be deferred until the user is detected as having expressed an interest in the feature; however, since this approach can introduce a delay
 - 25 before the item is available for presentation, the embodiments described below deliver feature items to the mobile device of the user without awaiting a specific expression of interest in each feature (though, of course, a general filtering may be applied as to what items are delivered according what types of features are of interest to the user). Preferably, each feature or feature item is given a property indicating whether feature item delivery is
 - 30 to be effected automatically upon delivery or only after a user has expressed an interest in the feature; this enables important items (such as warning messages concerning features associated with potentially hazardous real-world items) to be pushed to the user whilst

other items are subject to an expression of interest by the user. Advantageously, a user may elect to have feature items automatically presented even when the corresponding feature/item property does not require this. Furthermore, since as will be described hereinafter, pre-emptive caching of feature items in the user's mobile device may be implemented, automatic presentation is qualified so as only to apply where the user is in the active zone of the feature with which the feature item is associated.

Considering the Figure 1 example in more detail, the environment depicted is an exhibition hall 10 having rooms 11 to 17 where:

- 10 - room 11 is an entrance foyer with reception desk 18 but no associated virtual features;
- room 12 is a reference library with no associated virtual features;
- rooms 13, 14 and 15 are used for displaying real-world objects, namely paintings 20 and sculptures 21, for each of which there is a corresponding virtual feature centred on the object concerned and with an associated active zone 25 (indicated by a dashed line);
- 15 - room 16 is used for experiencing virtual features for which there are no corresponding real-world objects, the location associated with each feature being indicated by a cross 22 and the corresponding active zone 25 by a dashed line; and
- 20 - room 17 is a cafeteria with no associated virtual features.

Virtual features are also defined in correspondence to the majority of openings 23 between rooms, the active zones 25 associated with the features again been indicated by dashed lines. Typically, the feature items associated with these features are incidental information concerning the room about to be entered and are automatically presented. It will be seen from Figure 1 that only a single feature is applied to an opening 23 so that it is not possible to tell simply from the fact that a user is detected in the active zone of the feature which room the user is about to enter; however, as will be later described, it is possible to determine from the user's past activity (either location based or feature based) the general direction of progression of the user and therefore which room is about to be entered. This enables the appropriate feature item to be selected for delivery to the user from amongst the items associated with the feature.

On entering the exhibition hall 10, a user 30 collects a mobile device 31 from the reception desk 18 (or the user may have their own device). This device 31 cooperates with location-related infrastructure to permit the location of the user in the hall 10 to be determined. A number of techniques exist for enabling the location of the user to be determined with reasonable accuracy and any such technique can be used; in the present example, the technique used is based on an array of ultrasonic emitters 33 (represented in Figure 1 by black triangles) positioned at known locations in each room (typically suspended above human level). The emitters 33 are controlled by controller 32 to send out emitter-specific emissions at timing reference points that are indicated to the mobile device 31 by a corresponding radio signal sent by the controller 32. The device 31 is capable of receiving both the timing reference signals and the emissions from the ultrasonic transmitters 33. The device 31 is also pre-programmed with the locations of these emitters and is therefore able to calculate its current location on the basis of the time of receipt of the emissions from the different emitters relative to the timing reference points.

The exhibition hall is equipped with a wireless LAN infrastructure 36 comprising a distribution system and access points 37. The wireless LAN has a coverage encompassing substantially all of the hall 10, the boundary of the coverage being indicated by chain-dashed line 38 in Figure 1. The wireless LAN enables the mobile device to communicate with a service system 35 to download feature items appropriate to the feature (if any) corresponding to the current location of the user. In the present example, the determination of when the location of the user (as determined by the device in the manner already described) places the user within the active zone of a virtual feature, is effected by the service system; however, it is also possible to have the device 31 carry out this determination provided it is supplied with the appropriate information about the feature zones.

It will be appreciated that communication between the device 31 and service system 35 can be effected by any suitable means and is not limited to being a wireless LAN.

Figure 2 shows the mobile device 31 and service system 35 in more detail. More particularly, the mobile device 31 comprises the following functional blocks:

- A location determination subsystem 40 with an associated timing reference receiver 41 and ultrasonic receiver 42 for receiving the timing reference signals from the location infrastructure 32 and the emissions from the ultrasonic emitters 33 respectively; the location determination subsystem 40 is operative to use the outputs of the receivers 41 and 42 to determine the location of the mobile device (as already described above) and to send location reports to the service system 35.
 - A visit data memory 43 for holding data about the current “visit” – that is, the current tour of the hall 10 being undertaken by the user of the mobile device 31.
 - A feature-item cache 44 for caching feature items delivered to the mobile device 31 from the service system 35. The cache 44 has an associated cache manager 45.
 - A communications interface 46 for enabling communication between the mobile device 31 and the service system 35 via the wireless LAN infrastructure 36.
 - A user interface 48 which may be visual and/or sound based; in one preferred embodiment the output to the user is via stereo headphones 60.
 - A visit manager 47 typically in the form of a software application for providing control and coordination of the other functions of the mobile device 31 in accordance with input from the user and the service system 35.
 - A visit path guide 49 for giving the user instructions / indicators for following a planned route around the hall 10.
- Much of the foregoing functionality will typically be provided by a program-controlled general purpose processor though other implementations are, of course, possible.

The visit data held by memory 44 will typically include a user/device profile data (for example, indicating the subjects of interest to the user, the intended visit duration, and the media types that can be handled by the device), an electronic map of the hall 10, the user’s current location as determined by the subsystem 40, and the identity of the feature (if any) currently being visited together with the IDs of its related feature items. The visit data also includes a feature history for the visit, which is either:

- the history of visited features and their related feature item IDs in the order the features were visited (thus, a feature is added to the top of the visited-feature history list when the feature is encountered), or
- the history of accessed features and their related feature item IDs in the order the

features were visited (thus, a feature is added to the top of the accessed-feature history list when one of its feature items is accessed by - that is, presented to - the user whilst the feature is the currently visited feature).

If a visited-feature history list is kept, a history of accessed features can be embedded in it by providing each feature in the history with an associated flag to indicate whether or not the feature was accessed whilst current. Although keeping a visited-feature history provides more information about the visit, it will inevitably use more memory resources than an accessed-feature history and in many cases it will only be desired to track features which the user has found sufficiently of interest to access an associated feature item. Where the purpose of the feature history is simply to keep a list of features (and related feature items) that were of interest to the user, it may be desirable to exclude from the list features for which items were automatically presented but are not associated with exhibits (real or virtual) - that is, exclude features concerned with incidental information about the hall.

The feature history preferably covers the whole of the visit though it may alternatively only cover the most recently visited/accessed features. In either case, the most recent several entries in the history list form what is hereinafter referred to as the "feature tail" of the user and provides useful information about the path being taken by the user.

The visit data held in memory 43 may further include details of a planned route being followed by the user, and a history of the locations visited by the user (this may be a full history or just the locations most recently visited - hereinafter termed the "location tail" of the user).

The service system 35 comprises the following main functional elements:

- A communications interface 50 for communicating with the mobile device 50 via the wireless LAN infrastructure 36.
- An internal LAN 51 (or other interconnect arrangement) for interconnecting the functional elements of the service system.
- A data store 52 for storing feature data and, in particular, a feature record for each feature with each record comprising the feature identifier, the subject of the feature, the corresponding real-world location and extent of the feature's active zone, the IDs

and media type of the or each associated feature item, and a flag which when set indicates that feature item presentation of an associated feature item is to be effected automatically upon delivery when the feature is being visited.

- A feature-item server 53 for serving an identified feature item to the mobile device 31 in response to a request from the latter.
- A location report manager 54 for receiving location reports from the location determination subsystem 40 of the mobile device and for passing on data from the reports to functional elements 55 and 56 (see below).
- A pheromone trail subsystem 55 for receiving location data, via manager 54, from all user mobile devices to build up trail data in a manner akin to the use of pheromones by ants.
- An item-data response subsystem 56 for receiving location and other data from the manager 54 in order to prepare and send a response back to the mobile device 31 that provided the location data, about what feature items it needs, or is likely to need, both now, in view of a feature currently being visited, and (where, as in the present embodiment, pre-emptive caching is implemented) in the near future. Subsystem 56 comprises a location-to-feature item translation unit 57 which can either be implemented independently of the data held in store 52 or, preferably, be arranged to operate by querying the store 52, the latter having associated functionality for responding to such queries. Subsystem 56 further comprises a prediction unit 58 for predicting, in any of a variety of ways to be described hereinafter, what feature items are most likely to be needed in the near future.
- A route planner 59 for responding to requests from the mobile device 31 for a route to follow to meet certain constraints supplied by the user (such as topics of interest, time available, person or tour to follow, an exhibit or facility to be visited, etc). In providing a planned route, the route planner will typically access data from one or both of the feature data store 52 and the pheromone trail subsystem 55. The route planner 59 can conveniently hold a master map of the hall 10 for use by itself and the other elements of the service system 35, and for download to each mobile device 31 at the start of each new visit and/or whenever the master map is changed.

The functional elements of the service system 35 can be configured as a set of servers all connected to the LAN 51 or be arranged in any other suitable manner as will be apparent to

persons skilled.

The mobile device 31 and service system 35 provide a number of useful capabilities that will each be described in detail below after an overview of the general operation of the mobile device and service system during a visit. It is to be understood that the split of functionality between the mobile device 31 and service subsystem 35 can be varied substantially from that indicated for the Figure 2 embodiment; indeed all functionality can be provided either entirely by the mobile device 31 (with all feature items being stored in the device) or by the service system 35 (with the presentation of feature items to a user being by means of fixed input/output devices located around the hall near the locations associated with the virtual features).

In general terms, a user starting a visit can request a route to follow using the user interface 48 of the mobile device 31 to indicate parameters to be satisfied by the route. This route request is sent by the visit manager to route planner 50 and results in the download to the mobile device 31 of a planned route. The path guide 49 then provides the user (typically, though not necessarily, only when asked) with guide indications to assist the user in following the planned route. Where the interface 48 includes a visual display, this can conveniently be done by displaying a map showing the user's current location and the planned route; in contrast, where only an audio interface is available, this can be done by audio cues to indicate the direction to follow. A user need not request a planned route and in this case will receive no guide indications. A user may request a route plan at any stage of a visit (for example a route to an exhibit of interest).

As the user moves through the hall, the location determination subsystem 40 sends periodic location reports 62 (see Figure 3) to the location report manager 54 of the service system 35 via the wireless LAN 36. In addition to the user's current location, these reports typically include a user identifier (and possibly, additionally or alternatively, a type identifier indicative of any variable of interest such as, for example, the group of users to which the device user belongs or an activity being undertaken by the user), user/device profile data, and prediction-assist data for use by the prediction unit 58 in predicting what feature items are likely to be needed shortly. This prediction-assist data can comprise one

or more of the following: route data concerning any planned route being followed; the user's "location tail"; and the most recent feature (either the "most-recently visited" or "most-recently accessed") associated with the user, either provided alone or as part of the user's "feature tail".

5

When a location report 62 is received by the manager 54, it passes on the user's current location in the report to the pheromone trail subsystem 55 to enable the latter to build up trail data from all devices; additionally, the user and/or type identifier may be passed on to subsystem 55 if provided in the location report. The user's current location is also passed
10 to the item-data response subsystem 56 together with any profile data and prediction-assist data in the location report 62. The item-data response subsystem 56 then constructs and sends a response 65 (see Figure 4) to the mobile device 31 that originated the location report.

15 More particularly, the location-item to feature translation unit 57 of subsystem 56 uses the data passed to subsystem to determine the feature, if any, currently being visited by the user and thus what feature items are relevant to the user in their current location. In doing this, the unit 57 may also use the supplied profile data to disregard both features that do not relate to a subject of interest to the user and feature items of a media type that cannot be
20 handled by the mobile device 31. The unit 57 may also use elements of the prediction-assist data (for example, the location or feature last encountered before the current one) to enable it to determine the direction of progression of the user and thus to select between feature items of a feature in dependence on the direction of approach of the user. This is done, for example, for the features associated with openings 25 in order to select a feature
25 item appropriate to entering a room. The IDs of feature items identified by the unit 57 together with the identity of the corresponding feature and the status of the automatic presentation flag of the feature, form a first part 66 of the response 65 to be sent back to the mobile device 31. Where the current location does not correspond to the active zone of any feature, the first response part 66 simply indicates this.

30

A second part 67 of the item-data response 65 is produced by the prediction unit 58 and comprises a list of the feature items most likely to be needed in the near future by the

mobile device 31; for each such feature item, the second response part 67 includes the feature ID, its type, size and probability of usage (discussed in detail hereinafter). Like the unit 57, the unit 58 uses supplied profile data to disregard feature items of features not of interest to the user or of a media type that cannot not be handled by the mobile device 31.

5 The number of feature items identified in response part 67 is preferably limited (for example, to ten such items). The item-data response subsystem 56 then sends the response 65 back to the mobile device 31 of the user by using a return address supplied with the original location report 62 and passed to subsystem 56 by the manager 54.

10 Rather than having the prediction unit 58 provide a prediction each and every time the mobile device 31 sends a location report, it is possible to arrange for the prediction unit 58 only to operate when required by the mobile device 31 with the latter only requiring a prediction, for example, every nth location report or only after the user has moved a certain distance since the last prediction made by unit 58. Conveniently, the location report field
 15 used to carry the prediction-assist data is also used to indicate when a prediction is required by, for example, setting the field to a predetermined value when prediction is not required.

The item-data response received back at the mobile device 31 is processed by the visit manager 47. If the first part 66 of the response identifies a feature (thereby indicating that
 20 the current location of the user corresponds to the active zone of feature), the manager 47 updates the 'current feature' data in memory 45 to the feature identifier and item IDs in the first response part. These item IDs are also passed to the cache manager 45 and are used by the latter to request immediate delivery of these items from the server 53 of the service system to cache 44, if not already present in the cache. If the feature history data held by
 25 memory 43 relates to visited, rather than accessed, features, and if the feature identifier and item IDs in the first response part 66 differ from the most recent entry in the feature history list, the latter is updated with the feature identifier and item IDs from the first response part 66.

30 In the case that no feature is identified in the first part of the response 65, the 'current feature' data in memory 43 is set to null.

The manager 47 also determines whether the (first) feature item (if any) identified in the first response part 66 is to be immediately presented to the user, this determination taking account of the setting of the automatic presentation flag in the first part of the response, any user indication (stored, for example in the profile data) that all items are to be automatically presented, and any monitored indications of the user's interest in the currently-visited feature. Where a feature item identified in the first response part is to be immediately presented to the user, the manager 47 requests the item from the cache manager 45 (there may be a delay in the delivery of the item if it has not yet been received from the server 53). At the same time, if the feature history concerns accessed features the manager 47 updates the feature history with an entry corresponding to the feature identifier and item IDs forming the 'current feature' data; where the feature history although recording all visited features, provides for indicating whether a feature has been accessed, the manager updates the feature history accordingly.

With respect to the data contained in the second part 67 of the response 65, the visit manager simply passes this data to the cache manager 45 which determines whether or not to request from server 53 any of the items identified that are not already in the cache 44. The cache manager 47 in making this determination takes account of the probability that an item will be needed in the near future and the available cache space. The cache manager 45 may decide to create additional cache space by flushing one or more items from the cache and/or by reducing the space they occupy, as will be more fully described hereinafter.

In this manner, the cache manager 45 seeks to ensure that the next item requested by the visit manager 47 as the user progresses to the next feature will already be in the cache 44.

Following the processing of an item-data response by the visit manager, whenever a feature item is accessed (presented) either as a result of the visit manager 47 determining that the current feature is of interest to the user or as result of the user specifically requesting the item (for example, after inspecting the list of items associated with the current feature), then where the feature history data records accessed feature information, the visit manager 47 checks if the feature associated with the accessed item is the current feature and, if so,

updates the feature history to record the feature as an accessed one if not already so indicated.

The visit manager can also be arranged to keep a list in memory 43 of the individual
5 feature items accessed.

Having described the general operation of the mobile device 31 and service system 35, a more detailed description will now be given of some of the functionality embodied in the arrangement of Figures 1 and 2..

10

Coordinated Consumption

Often a user visiting the exhibition hall 10 will be doing so as a member of a party, be it a family group, a tour party or some other group. Where at least some members of the party have respective mobile devices, the situation is likely to arise that one member with a
15 mobile device accesses a feature item that they then wish to share with the other party members with mobile devices; indeed, this may the case not only for feature items but for any data item available from the service system 35 or other source accessible via the communications infrastructure exemplified in the embodiment of Figures 1 and 2 by wireless LAN 36. Where the data item is a simple media object such as image, then this is
20 can be achieved by the accessing member passing on the identity of the item to the other members either verbally or possibly by a message sent from their mobile device to the other mobile devices associated with the party.

However, where the item concerned is a streamed media object (in particular, audio and/or
25 video streams), simply having each mobile device independently access the object will result in uncoordinated consumption of the object at each device.

An arrangement for providing for coordinated consumption of the streamed media object is illustrated in Figure 5. In this Figure, the streamed media object 200 held on server 53 is
30 depicted as being streamed (arrow 201) to the mobile device 31A of a first user 30A. Upon the user 30A wished to share the experience provided by this media object with another user 30B, the user 30A causes their mobile device 31A (for example, by pressing a

dedicated button of user interface 48) to send a “share” message 202 to mobile device 31B (see arrow 203). This message is, for example, sent via the wireless LAN 36 using the addresses of the other mobile devices of members of the same party, these addresses having been previously stored in the visit data memory 43 of device 31A; alternatively, the device 31A may simply use a short-range communications means, such as a Bluetooth radio system, to send the message 202 to any device that is nearby (this approach, though less secure, is generally acceptable in an environment such as the exhibition hall 10 because the media object itself is not confidential). The message 202 includes both an identifier of the media object 200 currently being accessed by the mobile device 31A (for example, in the form of an item URI – Uniform Resource Indicator), and an indicator of the current position reached by the user 30A in consuming the streamed media object 200 (for example, frame number, time point, etc.).

The mobile device 31B on receiving the message 200 records its time of receipt and then, with or without specific consent from the user 30B, contacts the server 53 (arrow 204) and accesses the media object 200, the latter being delivered to device 31B as a media stream (arrow 205) independent of the media stream (arrow 201) being consumed by the device 31A. Since streamed media is generally delivered at a rate greater than its rate of consumption with the receiving device buffering the received but not yet consumed portions of the stream, the receipt by device 31B of the media object 200 can catch up with consumption by the first device 31A. Thus, mobile device 31B is arranged to delay rendering (presenting) the streamed media object until delivery of the object 200 reaches the position in the stream indicated in the message 200 plus any advance that the device 31B determines it should add to allow for further consumption of the media object by the first device 31B between when the position indicator was inserted in the message 202 and the start of rendering by the second device 31B. This advance, where applied, can comprise one or more of the following components:

- a component taking account of the message assembly and transmission time from the mobile device 31A until received at the mobile device 31B (this can be a preset approximation);
- a component taking account of the time between message receipt at device 31B and the start of receipt at the device of the media object 200 (as timed internally by the

device 31B);

- a component taking account of the time to move through the media object being streamed to the device 31B to reach a position corresponding to the then current point of consumption at device 31A (this will generally involve a predictive process).

5 Rather than the device 31B only starting rendering (presenting) the media stream to user 30B when the estimated position of coordination with device 31A is reached, the device 31B can be arranged to render the preceding portion of the stream in fast time – that is, presentation to the user will appear to be at high speed though typically in practice this is done by rendering only spaced samples of the stream (for example, every n th frame of a
10 video sequence). Normal rendering of the stream is then started when the consumption of the media stream at device 31B reaches the estimated position of coordination with device 31A.

Where the server 53 is operative to initiate streaming of the media object 200 at a specified
15 offset into the object media stream, then the mobile device 31B is preferably arranged to take advantage of this capability by requesting streaming to start at the nearest available (lagging) offset to a point that the device 31B predicts will be the current point of consumption by the first device 31A by the time the second device 31B is ready to render the media stream from the server 53. A similar effect can be obtained by the second device
20 31B informing the server of the identity of the first device 31A and then arranging for the server to commence delivery of the media object to the second device 31B from a position corresponding to the current delivery position to the first device 31A less an amount corresponding to the cache size allowed in the first device 31A for caching the media object as it is streamed. This latter approach is primarily of interest if this cache size is
25 relatively small as compared to the overall run time of the media object.

Of course, the first user 30A may decide to pause consumption of the media object 200 at the time the user decides to share experiencing the object with the other members of the same party, this pause being to enable the other users to access the media object at the
30 earliest possible coordinated position for going forward from the first user's current position. If the first user pauses the streaming of object 200 at the time of sending message 202, this is preferably indicated in the message 202 and enables the receiving device 31B

to dispense with adding any advance to the position indicated in the message. When the second device 31B becomes ready to render the media object from that indicated position, it signals to the first device 31A to resume consumption of object 200 and then itself starts consumption from the indicated position (possibly with a small delay corresponding to the time needed for the first device to react). In fact, rather than the second device 31B starting consumption based on when it sends a signal to the first device indicating that it is ready to do so, the second device 31B can be arranged to wait for a “go” signal back from the first device before starting. This enables the first device 31A to ensure that all devices which are to participate in coordinated consumption, are ready to do so before consumption begins (in other words, the device 31A waits to receive signals from all expected devices indicating they are ready to start consumption before it sends out the “go” signal).

It is possible to arrange for the second mobile device(s) 31B to assume that the first device 31A will have paused the media stream at the time of sending the message 202 (indeed, such a pause can be enforced at device 31A in coordination with sending of the message 202); in this case, the message would not need to include a “pause” indication. If this default arrangement is used but continued consumption at the instigating device 31A is still permitted, then in cases where device 31A continue its consumption, this is preferably indicated in message 202 to permit the device 31B to add an appropriate advance as already discussed.

One or both of the devices 31A and B can be arranged to send further coordination signals at any time during the course of consumption of the media object 200 by the devices, in order to compensate for drift in consumption rates. Thus, for example, the device 31A as the instigating device, can be arranged to send periodic coordination signals to the device 31B which indicate the current position reached by the device 31A; the device 31B uses this information either to jump backwards/forwards in the stream it is receiving or to make appropriate adjustments to its rate of consumption of the media stream to return to synchronization with consumption by device 31A (for example, by the time the next coordination signal is expected to be received).

As well as the sending of periodic coordination signals, one or both of the devices can be

arranged to send change signals in correspondence to its own changes in position in the media stream (other than resulting from normal progression therethrough) and/or changes in its own progression through the media stream (such as, without limitation, rewind and fast forward), these change signals including an indication of the new position/progression mode to be adopted by the receiving device.

Rather than (or additional to) the current position reached in the media object 200 by device 31A being included in message 202, this information can be passed to the device 31B in a separate message sent in response to device 31B indicating that it is starting to receive the media object stream from server 53. This approach enables a more up-to-date current position to be used by the device 31B in determining when to start normal rendering of the media object 200.

Whilst coordinated consumption could be effected in the above-described manner for static devices separate by large distances, it is expected that the above-described method is most suitable where at least one of the devices is a mobile one and the devices have been brought into close proximity.

Variants

It will be appreciated that many variants are possible to the above described embodiment of the invention. For example, although in the embodiment described above, all feature items have originated from the same source, namely, item server 53, it is also possible to provide for multiple item sources each holding a respective subset of the items. In this case, the item identifier associated with each item can be arranged to indicate directly the source from which the item can be obtained, or some other mechanism can be employed to direct an item request to the appropriate source. The multiple item sources effectively form a distributed item server.

As already noted, the distribution of functionality between mobile devices and the service system is not limited to the distributions described above since the availability of communication resources makes it possible to place functionality where most suitable from technical and commercial considerations. Furthermore, in the foregoing reference to a

mobile device is not to be construed as requiring functionality housed in a single unit and the functionality associated with a mobile device can be provided by a local aggregation of units.

- 5 It will be appreciated that the above described methods and arrangements for coordinating the consumption of streamed media objects is not limited to situations where the media objects are associated with a currently visited space..

CLAIMS

1. A method of coordinated consumption of a streamed media object by first and second devices, the media object being accessible for streaming from a server, the method comprising the steps of:
- (a) streaming the media object from the server to the first device and presenting it to a user of this device;
 - (b) sending from the first device to the second device, during the course of step (a), data identifying the media object and a current position reached in presenting the object to the user of the first device;
 - (c) in response to a request from the second device, streaming the media object from the server to the second device in a separate stream to that involving the first device, and presenting the media object to the user of the second device such that normal presentation commences at a position at, or with an advance relative to, the said current position indicated in step (b).
2. A method according to claim 1, wherein presentation of the media object to the user of the first device in step (a) continues whilst the second device requests and starts to receive the media object in its own stream in step (c), the second device commencing normal presentation of the media object at an advance relative to the said current position indicated in step (b) comprising at least one of the following components:
- a component taking account of the time taken to pass said data identifying the media object from the first device to the second device;
 - a component taking account of the time for the second device to request and start to receive the media object stream from the server;
 - a component taking account of the time to move through the media object being streamed to the second device to reach a position corresponding to the estimated then current point of consumption of the media object at the first device.
3. A method according to claim 1, wherein presentation of the media object to the user of the first device in step (a) is paused whilst the second device requests and starts to receive the media object in its own stream in step (c), normal presentation of the media object

being started by both devices from the said current position indicated in step (b) following the second device indicating that it is at least ready to do so.

4. A method according to claim 3, wherein in step (c) the second device indicates to the first device when it is ready to commence normal presentation of the media object from the said current position indicated in step (b) but defers doing so pending a commencement signal from the first device, the first device sending this commencement signal after having received the ready-to-commence indication from the second device and the first device resuming its own presentation of the media object in coordination with the sending of the commencement signal.

5. A method according to any one of claims 1 to 4, wherein in step (c) the server starts streaming the media object to the second device from a position at or near the current position reached by the first device in presenting the media object.

15

6. A method according to any one of claims 1 to 5, wherein subsequent to the commencement of presentation of the media object by both the first and second devices in at least approximate coordination, presentation coordination signals are periodically sent from at least one device to the other to enable the latter to adjust its presentation of the media object to bring it into closer coordination with the presentation by said one device.

7. A method according to any one of claims 1 to 6, wherein subsequent to the commencement of presentation of the media object by both the first and second devices in at least approximate coordination, a change signal is sent from at least one device to the other upon the said one device changing its presentation position in or progression through the media object otherwise than as part of its normal progression therethrough, the said other device using this change signal to adjust its presentation of the media object correspondingly.

30

8. A method according to any one of claims 1 to 7, wherein in step (b) said data is sent from the first device to the second device by short-range communication means.

9. A method according to any one of claims 1 to 8, wherein in step (b) the identity of the media object and the current position reached by the first device in presenting the media object are sent separately from the first device to the second device.

5

10. A method according to any one of claims 1 to 9, wherein the first and second devices are mobile devices.

11. An arrangement for coordinated consumption of a streamed media object by first and second devices, the arrangement comprising:

- a server for storing the media object and for streaming it to requesting devices;
- a first device comprising:
 - first means for requesting and receiving said media object in a stream from the server and for presenting it to a user of the device, and
- 15 - second means for sending to the second device data identifying the media object and a current position reached in presenting the object to the user of the first device; and
- a second device comprising
 - first means for receiving said data from the first device and for using it to request
 - 20 the server to stream said media object to the second device, the server being arranged to respond to this request by streaming the media object to the second device in a separate stream to that involving the first device, and
 - second means for presenting the media object to the user of the second device such that normal presentation commences at a position at, or with an advance relative to,
 - 25 the said current position indicated in said data.

12. An arrangement according to claim 11, wherein the first means of the first device is arranged to continue presentation of the media object to the user of the first device whilst the second device requests and starts to receive the media object in its own stream, the second means of the second device being arranged to commence normal presentation of the media object at an advance, relative to the said current position, that comprises at least one of the following components:

30

- a component taking account of the time taken to pass said data identifying the media object from the first device to the second device;
- a component taking account of the time for the second device to request and start to receive the media object stream from the server;
- 5 - a component taking account of the time to move through the media object being streamed to the second device to reach a position corresponding to the estimated then current point of consumption of the media object at the first device.

13. An arrangement according to claim 11, wherein the first means of the first device is
 10 arranged to pause presentation of the media object to the user of the first device whilst the second device requests and starts to receive the media object in its own stream, the devices including means by which the second device can indicate to the first device that it is ready to commence presentation from said current position and both devices being arranged to
 thereafter start normal presentation of the media object from the said current position.

15

14. An arrangement according to claim 13, wherein the second device is so arranged that after indicating to the first device that it is ready to commence normal presentation of the media object from the said current position, the second device defers doing so pending a commencement signal from the first device; the first device being arranged to send this
 20 commencement signal after having received the ready-to-commence indication from the second device, and to resume its own presentation of the media object in coordination with the sending of the commencement signal.

15. An arrangement according to any one of claims 11 to 14, wherein the server is
 25 arranged to start streaming the media object to the second device from a position at or near the current position reached by the first device in presenting the media object.

16. An arrangement according to any one of claims 11 to 15, wherein at least one said device includes means for sending, subsequent to the commencement of presentation of the
 30 media object by both the first and second devices in at least approximate coordination, presentation coordination signals to the other device, the said other device including means for using these presentation coordination signals to adjust its presentation of the media

object to bring it into closer coordination with the presentation by said one device.

17. An arrangement according to any one of claims 11 to 16, wherein at least one said device includes means for sending, subsequent to the commencement of presentation of the media object by both the first and second devices in at least approximate coordination, a change signal to the other device upon the said one device changing its presentation position in or progression through the media object otherwise than as part of its normal progression therethrough, the said other device including means for using this change signal to adjust its presentation of the media object correspondingly.

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18. An arrangement according to any one of claims 11 to 17, wherein the second means of the first device and the first means of the second device comprises complementary short-range communication means for sending said data from the first device to the second device.

15

19. An arrangement according to any one of claims 11 to 18, wherein the second means of the first device is arranged to send the identity of the media object and the current position reached by the first device in presenting the media object, separately to the first means of the second device.

20

20. An arrangement according to any one of claims 11 to 19, wherein the first and second devices are mobile devices.

ABSTRACT**Method and Arrangement for Consumption of a Streamed Media Object
by Multiple Devices**

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For members (30) of a party visiting a space with which media objects (200) are associated, the shared experience can be enhanced by the sharing of such objects by the group members for presentation on mobile devices (31) carried by the group members.

- 10 Where the media object is a streamed media object, the experience can be further enhanced by coordinating the consumption of the object by the group members. To this end a first user (30A) causes their device (31A) to send an identifier of the media object (200) and the user's current position in the object to the other devices (31B) which then request the same object from the server (53) and thereafter start presentation at, or in advance of the
- 15 indicated position reached by the first user. Such coordination of consumption can be applied in respect of other types of media objects and not just those associated with a currently visited space.

(Figure 5)

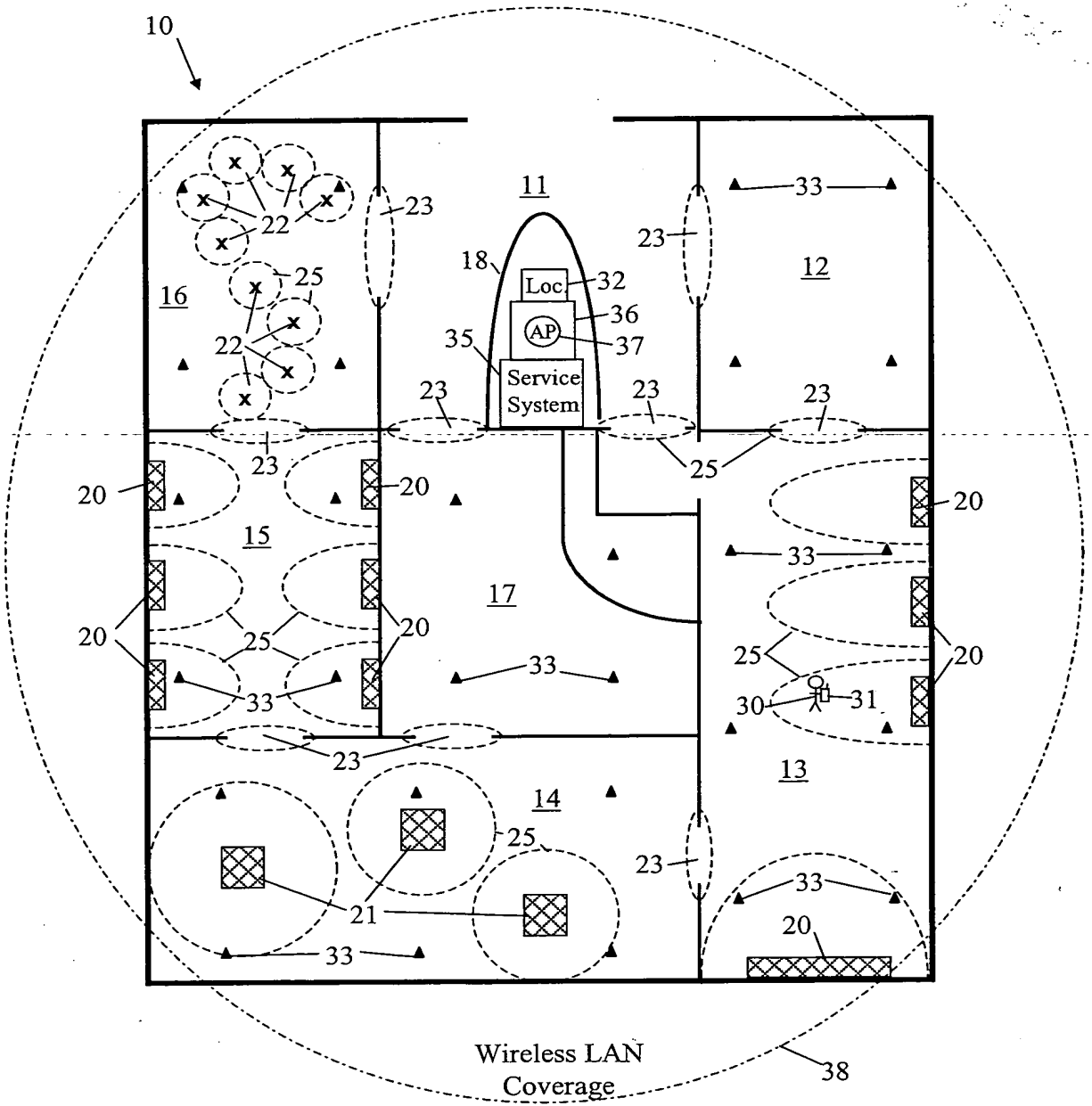


Figure 1

2 / 4

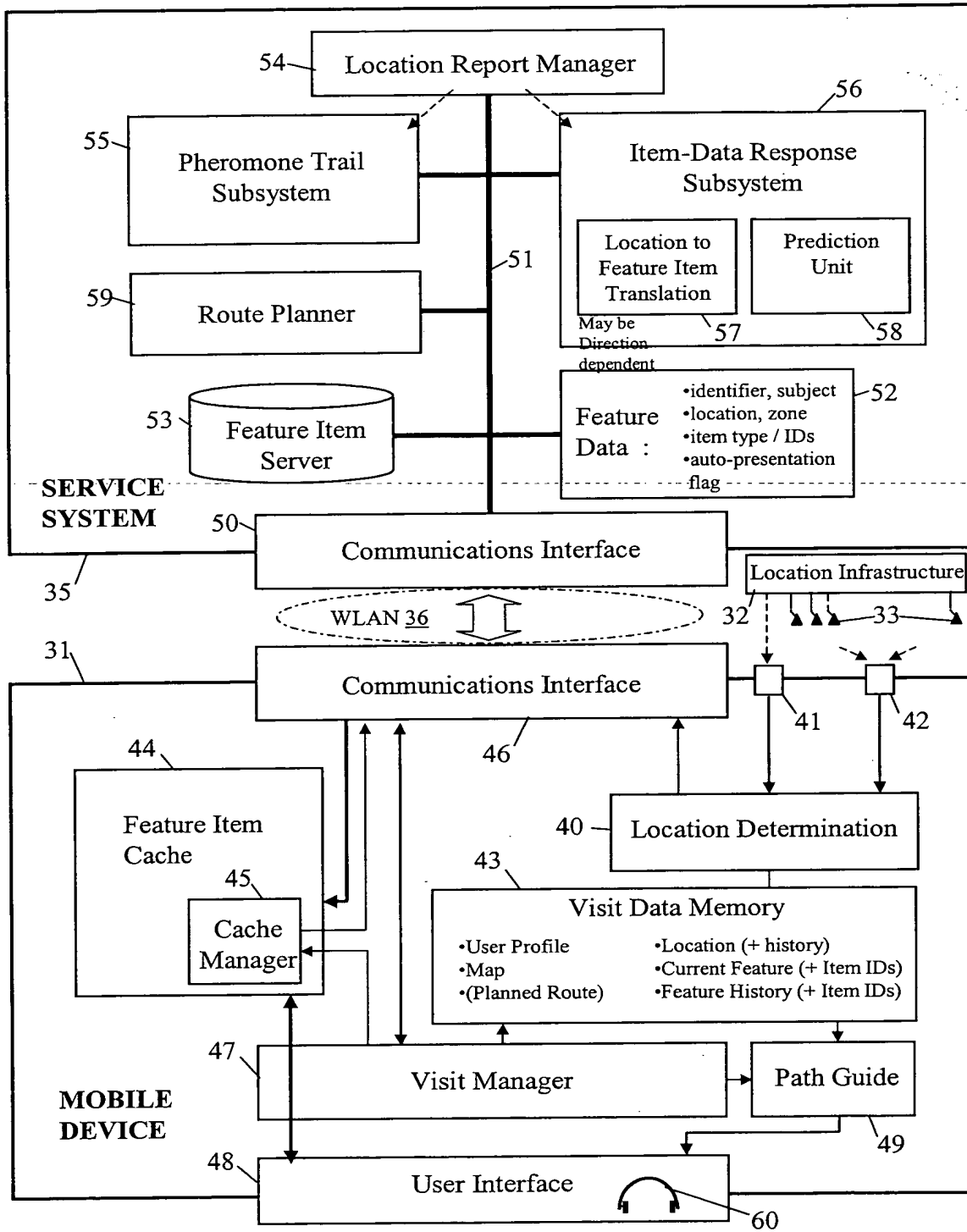


Figure 2

Location Report 62

User Identity	Location	Profile Data	Prediction-Assist Data
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Figure 3

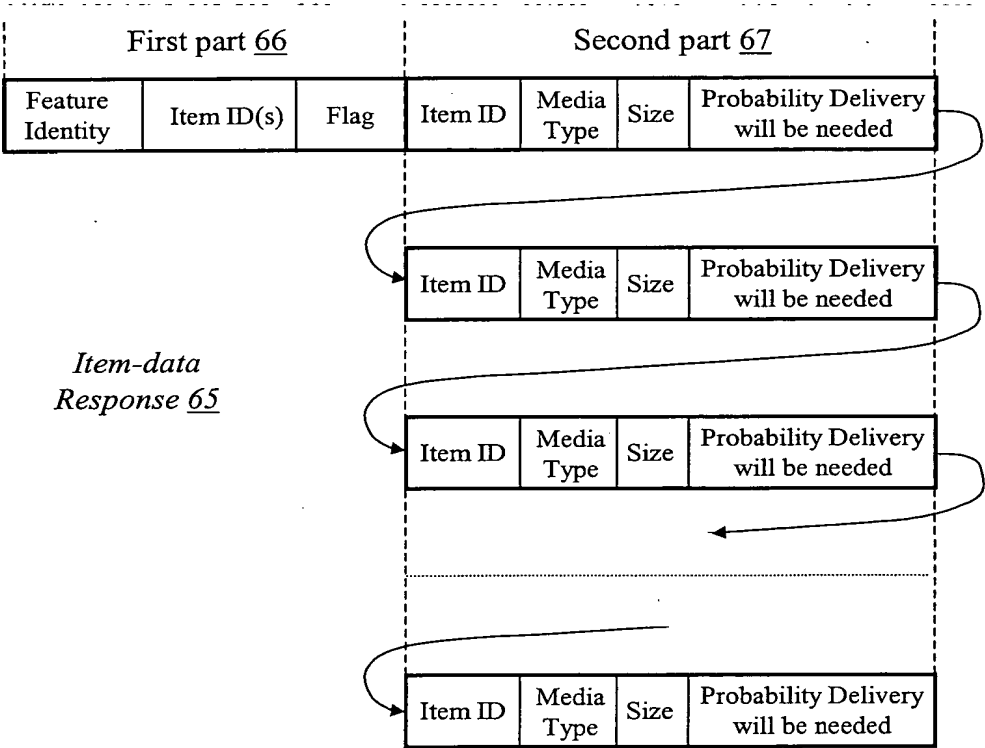


Figure 4

4/4

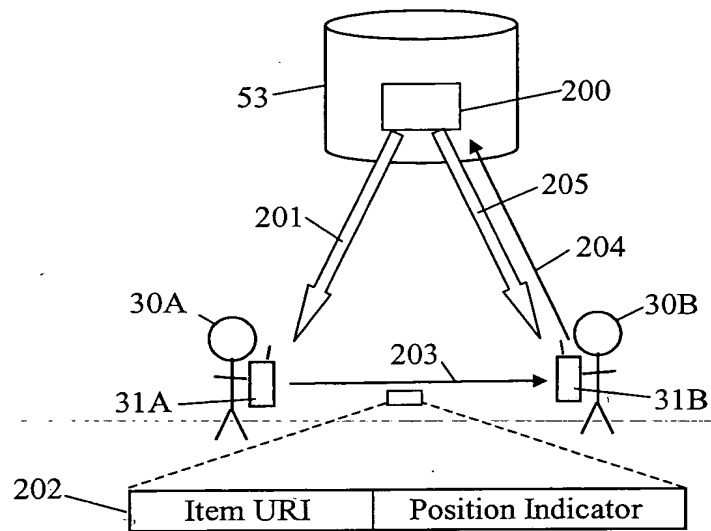


Figure 5